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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,434	03/18/2004	Henry P. Moreton	NVIDP015A/P001241	7140

28875 7590 04/08/2008
Zilka-Kotab, PC
P.O. BOX 721120
SAN JOSE, CA 95172-1120

EXAMINER	
AMIN, JWALANT B	
ART UNIT	**PAPER NUMBER**
2628	
MAIL DATE	**DELIVERY MODE**
04/08/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/804,434	**Applicant(s)** MORETON ET AL.
	Examiner JWALANT AMIN	**Art Unit** 2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 5-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 1/22/2008 have been fully considered but they are not persuasive.

2. Regarding claims 1, 16 and 17, the applicant argues that Aleksic and Cosman fail to teach "... modifying is based on a depth-component of the algorithm" (see pg. 6 of applicant's remarks).

3. However, the examiner interprets that Aleksic teaches modifying a value (x) (N summed with ΔN produces a resulting vector N + ΔN, which is perpendicular to the bumped surface) based on an algorithm (addition corresponds to algorithm), wherein modifying is based on the normal shading component (col. 1 lines 52-57, col. 3 lines 4-6, col. col. 4 lines 1-35, col. 6 lines 25-32, col. 10 lines 2-19; it should be noted that normal shading component is a product of a normal vector of a object and a light vector; when vector N + ΔN is multiplied with the light vector L, it results in the desired shading function for this the particular pixel location and thus determine bump mapping pixel-by-pixel; the display value of a pixel is thus determined using the bump-shading component and a normal shading component, which includes a normal vector).

Although Aleksic teaches the claimed limitations as stated above, Aleksic does not explicitly teach normal vector is related to the depth-component. However, Cosman teaches to calculate angular tilts U and V from the values in height map and stored in bump angle memory (col. 1 lines 55-57, col. 6 lines 15-50; the angular tilt of the bump map is considered as equivalent to the normal vector as both the angular tilt and the

normal vector represents the curvature of the bump map; height map is the functional equivalent of a depth map; therefore, Cosman teaches to derive the normal vector from the depth map (depth-component), and Aleksic already teaches that modifying is based on the normal vector; values of height map corresponds to the depth value). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to calculate the angular tilts from the height map as taught by Cosman and apply it into the method Aleksic because by applying the local tilt to the surface normal of a bump texture map helps to crease illusions of bumps (col. 1 lines 55-57).

4. Regarding claim 5, the applicant argues "...merely disclosing that a complementary computation is needed to raise the brightness of a scene to an overall average brightness, in addition to disclosing a wave bump map and tuning coefficients where the bumps exist, fails to even suggest the modifying allows a lighting operation to display an interaction of displayed objects" (see pg. 7 of applicant's remarks).

5. However, the examiner interprets that Aleksic, in view of Cosman teaches to tune the modification values stored with a polygon to achieve correct brightness of the ocean within the specular area (col. 1 lines 55-57, col. 6 lines 15-67, col. 9 lines 6-15 and lines 35-67, col. 10 lines 1-54; the angular tilt of the bump map is considered as equivalent to the normal vector as both the angular tilt and the normal vector represents the curvature of the bump map; height map is the functional equivalent of a depth map; therefore, Cosman teaches to derive the normal vector from the depth map (depth-component), and Aleksic already teaches that modifying is based on the normal vector; wave bump map and ocean corresponds to displayed objects; wave bump map on a simulated

ocean corresponds to the interactive of displayed objects; raising the brightness of the scene to overall average brightness to compensate for the brightness decrease in areas near the specular highlight corresponds to applying a lighting operation; it should be noted that the actual modification values stored within a polygon to increase the brightness of areas surrounding the highlight will depend on the nature of the bump map). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to allow lighting operation display interaction between displayed objects as taught by Cosman and apply it into the method Aleksic because such a method helps to decrease the brightness of the specular highlights in a well behaved way to control the highlight aliasing (col. 3 lines 25-27).

6. Regarding claims 13-15, the applicant argues "... nowhere in the cited excerpts is a technique taught wherein y equals three, and wherein y equals four, especially where X includes ($n * T_{proj}[y]$), where $T_{proj}[y]$ includes the projection transform" (see pg. 8 of applicant's remarks).

7. However, the examiner interprets that Aleksic and Cosman, in view of Demers teach to transform incoming texture coordinates, geometry or normals pertaining to a surface in object space into projected texture coordinates in homogeneous eye space (col. 8 lines 10-24, col. 9 lines 12-61; matrix transformation producing projected texture coordinates corresponds to projection transformation of the incoming texture coordinates or normals; normals [N_x, N_y, N_z] corresponds to vector; the dot product calculation between the normals and the matrix corresponds to ($n*T_{proj}[y]$), which further implies that X includes the dot product calculation between the normals and the matrix;

it should be noted although the reference does not use same terminology as the claimed invention, the functional equivalents of the related terms has been suggested by the examiner). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to produce projected texture coordinates in homogeneous (eye) space using matrix transformation as taught by Demers into the system of Aleksic and Cosman because matrix transformation could be used for any type of texturing dependent on the geometry of the object (e.g. environment mapping, reflection mapping, etc) (col. 10 lines 65-67 and col. 11 lines 1-5).

Although the combination of Aleksic, Cosman and Demers teach all of the claimed limitations as stated above, they do not explicitly teach y equals three and y equals four. However, Jenkins teaches a case when viewpoint motion vector is parallel to view direction vector, object space x and y values are constant while z value varies (col. 53 lines 56-67, col. 54 lines 38; constant y corresponds to y=3 or y=4; it should be noted that by y = 3 and y = 4, the examiner interprets the value of y stays constant during the transformation process). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to use constant values of y as taught by Jenkins into the system of Aleksic, Cosman and Demers because these method gives exact results requiring fewer floating point operations than the floating point operations required for multiplication of a vector [x y z] by a general transformation matrix, and reduce the cost of transformation-projection (col. 54 lines 20-23 and lines 29-34).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-3, 5-6, 8, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksic et al. (US 6,175,368; hereinafter referred to as Aleksic), and further in view of Cosman (US 6525740).

10. Regarding claims 1, 16 and 17, Aleksic (Fig. 1, Fig. 6, col. 3 lines 62-67, col. 4 lines 1-35, col. 9 lines 46-65, col. 10 lines 2-19 and lines 60-67) teaches a method and an apparatus (Fig. 1) for modifying a value (x) (N summed with ΔN) based on an algorithm (addition corresponds to algorithm); and performing an operation (dot product with light vector corresponds to the operation performed on the resulting/modified value) on pixel data taking into account the modified value (N + ΔN); wherein the value (N) is modified utilizing the equation: x + Δ (X), where Δ includes a value read from a texture map (N + ΔN corresponds to x + Δ (X); ΔN is obtained by using the coefficient B_u and B_v determined by utilizing the bumb map coordinates to access the bump map, which may be a texture map). Aleksic further teaches modifying is based on the normal shading component (col. 3 lines 4-6).

Although Aleksic teaches the claimed limitations as stated above, Aleksic does not explicitly teach normal vector is related to the depth-component. However, Cosman teaches to calculate angular tilts U and V from the values in height map and stored in

bump angle memory (col. 1 lines 55-57, col. 6 lines 15-50; the angular tilt of the bump map is considered as equivalent to the normal vector as both the angular tilt and the normal vector represents the curvature of the bump map; height map is the functional equivalent of a depth map; therefore, Cosman teaches to derive the normal vector from the depth map (depth-component), and Aleksic already teaches that modifying is based on the normal vector; values of height map corresponds to the depth value). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to calculate the angular tilts from the height map as taught by Cosman and apply it into the method Aleksic because by applying the local tilt to the surface normal of a bump texture map helps to crease illusions of bumps (col. 1 lines 55-57).

11. Regarding claim 2, Aleksic teaches the pixel data includes a normal value (vector N corresponds to the normal value), and further comprising modifying the normal value ($N + \Delta N$; col. 9 lines 46-65, col. 10 lines 2-19 and lines 60-67).

12. Regarding claim 3, Aleksic teaches the operation includes a lighting operation (performing a dot product of $N + \Delta N$ with light vector L produces shadowing function for the particular pixel location; this operation corresponds to lighting operation; col. 9 lines 46-65, col. 10 lines 2-19 and lines 60-67).

13. Regarding claim 5, Regarding claims 1, 16 and 17, Aleksic (Fig. 1, Fig. 6, col. 3 lines 62-67, col. 4 lines 1-35, col. 9 lines 46-65, col. 10 lines 2-19 and lines 60-67) teaches a method and an apparatus (Fig. 1) for modifying a value (x) (N summed with ΔN) based on an algorithm (addition corresponds to algorithm); and performing an operation (dot product with light vector corresponds to the operation performed on the

resulting/modified value) on pixel data taking into account the modified value (N + ΔN); wherein the value (N) is modified utilizing the equation: x + Δ (X), where Δ includes a value read from a texture map (N + ΔN corresponds to x + Δ (X); ΔN is obtained by using the coefficient B_u and B_v determined by utilizing the bumb map coordinates to access the bump map, which may be a texture map). Aleksic teaches modifying is based on the normal shading component (col. 3 lines 4-6).

Although Aleksic teaches the claimed limitations as stated above, Aleksic does not explicitly teach modifying allows a lighting operation to display an interaction of displayed objects. However, Cosman teaches to tune the modification values stored with a polygon to achieve correct brightness of the ocean within the specular area (col. 1 lines 55-57, col. 6 lines 15-67, col. 9 lines 6-15 and lines 35-67, col. 10 lines 1-54; the angular tilt of the bump map is considered as equivalent to the normal vector as both the angular tilt and the normal vector represents the curvature of the bump map; height map is the functional equivalent of a depth map; therefore, Cosman teaches to derive the normal vector from the depth map (depth-component), and Aleksic already teaches that modifying is based on the normal vector; wave bump map and ocean corresponds to displayed objects; wave bump map on a simulated ocean corresponds to the interactive of displayed objects raising the brightness of the scene to overall average brightness to compensate for the brightness decrease in areas near the specular highlight corresponds to applying a lighting operation; it should be noted that the actual modification values stored within a polygon to increase the brightness of areas surrounding the highlight will depend on the nature of the bump map). Therefore, it

would have been obvious to one of ordinary skill in art at the time of present invention to allow lighting operation display interaction between displayed objects as taught by Cosman and apply it into the method Aleksic because such a method helps to decrease the brightness of the specular highlights in a well behaved way to control the highlight aliasing (col. 3 lines 25-27).

14. Regarding claim 6, Aleksic teaches the modifying allows the lighting operation to display bumpy shadows (dot product of light vector with $N + \Delta N$ produces a bump shadowing function for the particular pixel; this resulting shadow function is combined with rendered pixel data to produce the resultant display data for the given pixel; this display data displays bumpy shadows; Fig. 6, col. 3 lines 4-9, col. 9 lines 46-65, col. 10 lines 2-19 and lines 60-67).

15. Regarding claim 8, Aleksic teaches the operation includes a shadow mapping operation (desired shadow function; col. 10 lines 8-19).

16. Claims 7 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksic and Cosman, and further in view of Leather et al. (US 6,664,958; hereinafter Leather).

17. Regarding claims 7 and 9-11, although Aleksic and Cosman teaches all of the claimed limitations as stated above, they do not explicitly teach the operation includes a hidden surface calculation and that the value includes a depth-value, a clip-space z-value and a clip-space w-value. However, Leather teaches to apply the pixel depth values resulting from the z blending operation to a hidden surface removal operation

(col. 9 lines 55-67 and col. 10 lines 1-5; hidden surface removal operation corresponds to operation includes a hidden surface calculation; col. 9 lines 29-32, depth (z) corresponds to clip-space z-value; the examiner takes an official notice of the fact that it was known in art at the time of present invention that the depth coordinate z is known as w, when iteration of a coordinate for a non-projected texture takes place in the viewer's coordinate system). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to use the hidden surface removal operation of Leather and apply it into the system of Aleksic and Cosman because using hidden surface removal operation in conjunction with the z buffer allows the z texture to control whether parts of the texture mapped image are occluded by other objects in the scene (col. 10 lines 3-5).

18. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksic and Cosman, and further in view of Demers et al. (US 6,700,586; hereinafter Demers).

19. Regarding claims 12 and 13, although Aleksic and Cosman teaches all of the claimed limitations as stated above, they do not explicitly teach that X involves a projection transform, and X includes ($n * T_{proj}[y]$), where $T_{proj}[y]$ includes the projection transform, n includes a vector. However, Demers teaches to transform incoming texture coordinates, geometry or normals pertaining to a surface in object space into projected texture coordinates in homogeneous eye space (col. 8 lines 10-24, col. 9 lines 12-61; matrix transformation producing projected texture coordinates corresponds to projection

transformation of the incoming texture coordinates or normals; normals [N_x, N_y, N_z] corresponds to vector; the dot product calculation between the normals and the matrix corresponds to ($n*T_{proj}[y]$)). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to produce projected texture coordinates in homogeneous (eye) space using matrix transformation as taught by Demers into the system of Aleksic and Cosmanbecause matrix transformation could be used for any type of texturing dependent on the geometry of the object (e.g. environment mapping, reflection mapping, etc) (col. 10 lines 65-67 and col. 11 lines 1-5).

20. Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksic, Cosman and Demers, and further in view of Jenkins (US 6,028,608).

21. Regarding claims 14 and 15, although the combination of Aleksic, Cosman and Demers teach all of the claimed limitations as stated above, they do not explicitly teach y equals three and y equals four. However, Jenkins teaches a case when viewpoint motion vector is parallel to view direction vector, object space x and y values are constant while z value varies (col. 53 lines 56-67, col. 54 lines 38; constant y corresponds to y=3 or y=4; it should be noted that by y = 3 and y = 4, the examiner interprets the value of y stays constant during the transformation process). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to use constant values of y as taught by Jenkins into the system of Aleksic, Cosman and Demers because these method gives exact results requiring fewer floating point operations than the floating point operations required for multiplication of a vector [x y z]

by a general transformation matrix, and reduce the cost of transformation-projection (col. 54 lines 20-23 and lines 29-34).

22. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksic, Cosman, and Leather, and further in view of Akeley et al. (US 5819017; hereinafter Akeley).

23. Regarding claims 18 and 19, the statements presented above with respect to claims 10 and 11, are incorporated herein.

24. Although the combination of Aleksic, Cosman and Leather teach the limitations as stated above, they do not explicitly teach the clip-space z-value and w-value is extracted using a projection transform. However, Akeley teaches that the Z values (clip-space z-value) associated with the primitives are transformed according to standard projection division (projection transform) algorithms (col. 5 lines 29-31). Therefore, it would have been obvious to one of ordinary skill in art at the time of present invention to transform z values according to projection as taught by Akeley and use it into the method of Aleksic, Cosman and Leather because transforming z values associated with the primitives according to projection division algorithm gives an object the perception of depth (col. 5 lines 29-32).

Conclusion

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JWALANT AMIN whose telephone number is (571)272-2455. The examiner can normally be reached on 9:30 a.m. - 6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on 571-272-7653. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. A./
Examiner, Art Unit 2628

/Mark K Zimmerman/
Supervisory Patent Examiner, Art Unit 2628